

SN 10/052,862Docket No. S-97,794In Response to Office Action dated February 25, 2004

REMARKS

Claims 1-47 are pending in the present patent application. The present Office Action acknowledged Applicant's election of claims 1-47. As a result, claims 48-193 have been cancelled.

Claims 1-47 are rejected. According to the present Office Action, "...Claims 1-8, 16, 22-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rice et al. (3,988,704) in view of Sanders et al. (5,946,097), Bramson (5,422,73) and Li et al. (5,418,058). Rice et al. (3,988,704) shows light source 50, polarizer 32, photodetector 34, as claimed in claim 1..." and "...discloses the invention substantially as claimed except for a waveguide having a thin film of host reagent [and] a phase sensitive detector. Sanders et al. (5,946,097) shows a phase sensitive detector 23, see col. 10, lines 41-50, Bramson (5,422,713) shows a waveguide 34 and Li et al. (5,418,058) the use of a thin film of host reagent such as cyclodextrin, see col. 6, lines 59-68. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a phase sensitive detector 23 as disclosed by Sanders et al. (5,946,097), a waveguide 34 as disclosed by Bramson (5,422,713) in the device of Rice et al. (3,988,704) to achieve the apparatus as claimed, because the use of such phase sensitive detector would phase out the signals, the waveguide and a thin film of host reagent such as cyclodextrin on the waveguide would provide better conduction of the light beam. Regarding the features of Zeeman laser or HeNe laser or formation of cyclodextrin or different waveguide of lock in amplifier the use of the apparatus to PC or other organs, Official Notice is hereby taken that it is well known in the art for improving transmission of the light beam. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the device of Rice et al. (3,988,704) in view of Sanders et al. (5,946,097), Bramson (5,422,713) and Li et al. (5,418,058) such that the use [of] the Zeeman or HeNe laser or formation of cyclodextrin or lock in amplifier the use of the apparatus to PC or other organs for improving transmission of the light beam..."

Also according to the present Office Action, "...Claims 9-15, 17, 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rice et al. (3,988,704) in view of Sanders et al. (5,946,097), Bramson (5,422,713) and Li et al. (5,418,058) as

SN 10/052,862Docket No. S-97,794In Response to Office Action dated February 25, 2004

applied to claim 1 above, and further in view of Huang (6,222,951). As set forth above, Rice et al. (3,998,704), Sanders et al. (5,946,097), Bramson (5,422,713) and Li et al. (5,418,058) disclose the invention substantially as claimed except for the material of waveguide such as silicon nitride or other material. Huang (6,222,951) shows the use of silicon nitride, see col. 5, lines 40-50. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use silicon nitride for the waveguide, as disclosed by Huang (6,222,951) in the device of Rice et al. (3,988,704) in view of Sanders et al. (5,946,097), Bramson (5,422,713) and Li et al. (5,418,058) to achieve the apparatus as claimed, because the use of such silicon nitride for the waveguide would protect the waveguide..."

With regard to claim 1 of the present patent application, please note that a waveguide was claimed only inferentially in the original claim 1. Applicant has amended claim 1 to positively claim a waveguide sensor as an element of the chemical sensing apparatus. The waveguide sensor has a single mode waveguide and a selective thin film on the waveguide, the thin film having reagent that can bind to chemical compounds (see FIGURES 2, 3, 4, 5, 6, and 7, and the parts of the specification describing these Figures). Li et al. (US 5,418,058) describes the host reagents, their attachment to the surface oxide layers, and their use in forming inclusion complexes with chemical compounds. Applicant has rephrased the portion of claim 1 related to the laser light beam by more clearly stating that the light source is a laser that produces a laser light beam with two modes, that the modes are orthogonal in polarization, and that one mode is at one frequency and the other mode is at a different frequency (see FIGURES 1, 7, and 8 and the parts of the specification that describe these FIGURES such as page 9, second paragraph, which describes FIGURE 1 and the two modes having different frequencies). A laser (or a laser combined with specific optical components) that can produce these two orthogonal modes is a required part of the chemical sensing apparatus. According to amended claim 1, the laser is positioned to send the laser beam with these orthogonal modes into the waveguide. As these modes pass through the waveguide, one mode is retarded (i.e. delayed) relative to the other mode when the host reagent binds to chemical compounds. Examples of the reagent are the cyclodextrin derivatives, which have a basket-shaped structure, and chemical

SN 10/052,862Docket No. S-97,794In Response to Office Action dated February 25, 2004

compounds that can fit in the basket do so, and as they do, the retardation of one mode relative to another occurs and is detected. The other parts of the apparatus, which include the polarizer, photodetector, and phase detector, make it possible to detect this retardation of one mode relative to another. According to the present Office Action, the use of the Sanders et al. phase sensitive detector is to phase out signals, and the waveguide and a thin film of reagent such as cyclodextrin on the waveguide is to provide better conduction of the light beam. The phase sensitive detector in this case is not to phase out signals but to detect the phase changes as retardation of one of the modes relative to the other mode occurs, and the film having reagent is attached to the waveguide not to provide better conduction of a light beam but to provide the means for sensing chemical compounds by their inclusion into the reagent; this inclusion is detected as the retardation between the modes of the laser beam provided by the laser occurs. In addition, the use of silicon nitride as a preferred waveguide material is not because of any protective feature, as stated in the present Office Action, but because of its high dielectric constant; a waveguide made from silicon nitride produces an evanescent field that extends far enough away from the waveguide to encompass the thin film attached to the waveguide, but not further. This way, the signal produced by the apparatus of the invention is a result of chemical compounds that bind to the reagent in the film, and not to chemical compounds beyond the reach of the reagent. Applicant cannot find any motivation or suggestion in Rice et al. (3,988,704), Sanders et al. (5,946,097), Branson (5,422,713), Li et al. (5,418,058) and/or Huang (6,222,951) to combine the specific claimed elements of amended claim 1, i.e. the claimed waveguide sensor, a laser that produces a laser beam with two orthogonal modes, the polarizer and photodetector and phase sensitive detector. The idea that prior art devices could be modified to produce the claimed apparatus is not a proper basis for an obviousness rejection. Applicant is unable to find any teaching, suggestion, or incentive from the above references to make the combination as claimed in amended claim 1. Therefore, Applicant believes that amended claim 1 is not unpatentable over Rice in view of Sanders et al., Branson, and Li et al. and Huang, and respectfully requests that the rejection under 35 U.S.C. 103(a) be withdrawn.

SN 10/052,862Docket No. S-97,794In Response to Office Action dated February 25, 2004

Claims 2, 4-10, 22, 28, 32-34, 36, 37, 38, 40-42, and 45 depend directly or indirectly from claim 1 and include all the limitations of claim 1. Applicant believes that amended claim 1 is allowable, and therefore that claims 2, 4-10, 22, 28, 32-34, 36, 38, 40-42, and 45 are also allowable and respectfully requests that the rejections of these claims under 103(a) be withdrawn.

Claims 3, 11-21, 23-27, 29-31, 35, 39, 43-44, 46-193 have been cancelled.

Applicant respectfully requests that this amendment be entered into the present patent application.

For the reasons set forth above, Applicant believes that all currently pending claims are in condition for allowance, and such action at an early date is earnestly solicited. No new matter has been added by the above changes. Reexamination and reconsideration are respectfully requested.

Respectfully submitted,

Date: May 3, 2004

Samuel L. Borkowsky
Signature of Agent

Reg. No. 42,346
Phone (505) 665-3111

Samuel L. Borkowsky
Los Alamos National Laboratory
LC/IP, MS A187
Los Alamos, New Mexico 87545